

# Vector Arithmetic (Section Formula)

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## Question:

Show that the points **A**(-6, 10), **B**(-4, 6) and **C**(3, -8) are collinear and prove that  $AB = \frac{2}{9}AC$ .

## Solution:

If this determinant is zero,  $\begin{vmatrix} 1 & 1 & 1 \\ A & B & C \end{vmatrix}$  then  $A$ ,  $B$ , and  $C$  are collinear.

$$\text{Det} = \begin{vmatrix} 1 & 1 & 1 \\ -6 & -4 & 3 \\ 10 & 6 & -8 \end{vmatrix} = 1 \cdot (32 - 18) - 1 \cdot (48 - 30) + 1 \cdot (-36 + 40) = 0$$

$\therefore A$ ,  $B$ , and  $C$  are collinear.

Using the section formula, if  $B$  divides  $AC$  in the ratio  $m : n$ , then:

$$B\left(\frac{m \cdot 3 + n \cdot (-6)}{m + n}, \frac{m \cdot (-8) + n \cdot 10}{m + n}\right) = (-4, 6)$$

Equating the coordinates, we get

$$\frac{m}{n} = \frac{2}{7}$$

$\therefore$  It confirms that  $B$  divides  $AC$  in the ratio  $2 : 7$ . Since  $B$  divides  $AC$  in the ratio  $2 : 7$ , we have:

$$\frac{AB}{AC} = \frac{2}{2 + 7} = \frac{2}{9}$$

$\therefore AB = \frac{2}{9}AC$ , Hence proved.

